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GROUND WATER AND ECOSYSTEMS RESTORATION DIVISION
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June 17, 2014

MEMORANDUM

OFFICE OF
RESEARCH AND DEVELOPMENT

SUBJECT: Draft Addendum #1 Remedial Design and Remedial Action Work Plan For Operable Unit 2, Revised Groundwater Remedy, Site ST012, Former Williams Air Force Base, Mesa, Arizona (14-R09-002)

FROM: Eva L. Davis, Ph.D., Hydrologist
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TO: Carolyn d'Almeida, RPM
U.S. EPA, Region 9

I have reviewed the Draft Addendum #1, Remedial Design and Remedial Action Work Plan For Operable Unit 2, Site ST012, at the Former Williams Air Force Base, in Mesa, Arizona, dated June 2, 2014. This addendum outlines the steam injection/extraction startup strategy to be used for the Steam Enhanced Extraction system based on the observed presence of light nonaqueous phase liquids (LNAPL) in borings advanced for construction of the system of steam injection and extraction wells. The purpose of this addendum is to ensure that LNAPL does not migrate away from the thermal treatment zone due to steam injection, or minimize the potential for such undesirable migration. After reviewing the data available for the evaluation of LNAPL presence, I have concerns with the scoring system employed to categorize the boring intervals for potential LNAPL presence. I also have a concern about large areas with significant LNAPL contamination that, with the injection/extraction strategy outlined here, will not receive significant steam. These concerns are detailed in the comments given below.

General Comments

1. Section 3.0 describes the LNAPL scoring system used to determine the potential for each depth interval in each of the newly installed lower saturated zone (LSZ) wells to contain LNAPL. After reviewing a significant portion of the data, I propose a somewhat different approach to scoring the depth intervals of each LSZ boring for the potential presence of LNAPL:

- First, if the soil analytical data for that interval shows fuel component concentrations that are indicative of LNAPL (see Feenstra et al., 1991), then LNAPL at residual saturations or greater, should be considered present.
- Second, if a dye test within that interval was positive, then LNAPL at residual saturations or greater, should be considered present.
- If there was neither a soil sample or dye test performed in an interval, then follow the scoring given in the first three bullets on page 3-1. Because this leaves three scores to consider for each interval, rather than the original five, the total score needed for each of the categories (given in the three bullets starting at line 183) should be adjusted downward.

Using the scoring outlined above, I noted several intervals where the category assigned to a certain interval would differ from that shown on Figures 3-1 to 3-7. This however is not an exhaustive list of intervals where different results would be obtained by using the scoring system proposed above, as not all intervals of all LSZ borings were re-evaluated based on the proposed scoring system.

- LSZ11, 160 – 170 feet below ground surface (bgs) interval, is shown in Figure 3-2 as having “No Indication of Potential LNAPL”. However, the boring log shows that there was a positive dye test in this interval. The corresponding soil sample shows moderate concentrations of fuel components. This interval could be classified as “Possible Indication of Potential LNAPL” or “Indication of Potential Residual LNAPL”.
- LSZ17, 160 – 170 feet bgs interval, is shown in Figure 3-2 as having “No Indication of Potential LNAPL”. However, a soil sample obtained from a depth of 168 feet shows total petroleum hydrocarbon-gasoline range organics (TPH-GRO) of 11,000 milligrams per kilogram (mg/kg), and fuel constituent concentrations in the tens to hundreds of thousands of micrograms per kilogram (µg/kg), which is a clear indication of the presence of LNAPL (see Feenstra et al., 1991).
- LSZ18, 180 – 195 feet bgs interval, is shown in Figure 3-4 as having “Possible Indication of Potential LNAPL”. However, the boring log shows that there were two positive dye tests in this interval, which demonstrates that LNAPL is present at residual concentrations or greater.
- LSZ18, 220 – 230 feet bgs interval, is shown in Figure 3-6 as having “Possible Indication of Potential LNAPL”. However, a soil sample obtained from this interval shows fuel constituent concentrations that are indicative of LNAPL presence. Also, the boring log shows that there was a positive dye test in this interval. Both of these demonstrate that LNAPL is present at residual concentrations or greater.
- LSZ20, 220 – 230 feet bgs interval, is shown in Figure 3-6 as having “No Indication of Potential LNAPL”. However, the boring log at 225 feet bgs indicates the presence of black stains and strong odors, with PID reading of 219 and 121 ppm. According to

the scoring system provided in the document, this interval should be classified as "Possible Indication of Potential LNAPL".

- f. LSZ21, 220 – 230 feet bgs, is shown in Figure 3-6 as having "No Indication of Potential LNAPL". However, the boring log shows that a slight fuel odor was detected at 220 feet bgs, and the PID reading at this depth was 734 ppmv. By the scoring criteria provided in the document, this interval should be categorized as "Possible Indication of Potential LNAPL."
- g. LSZ21, 230 – 235 feet bgs, is shown in Figure 3-7 as having "No Indication of Potential LNAPL". However, the boring log shows that a slight fuel odor was detected at 230 feet and 235 feet bgs, and that a faintly positive dye test result was found at 235 feet bgs. By the scoring criteria provided in the document, this interval should be categorized as "Possible Indication of Potential LNAPL." Thus, Figure 4-3 should also show this boring as having "Possible Indication of Potential LNAPL."
- h. LSZ24, 170 – 180 feet bgs interval, is shown in Figure 3-3 as having "Possible Indication of Potential LNAPL". However, the boring log shows that there was a positive dye tests in this interval, which demonstrates that LNAPL is present at residual concentrations or greater.
- i. LSZ32, 170 – 180 feet bgs interval, is shown in Figure 3-3 as having "Possible Indication of Potential LNAPL". However, the boring log shows that there was a positive dye tests in this interval, which demonstrates that LNAPL is present at residual concentrations or greater.

2. Observation of Figures 4-1 to 4-3 shows that there are areas in each of the zones where significant LNAPL is likely present, but, with the proposed steam injection/extraction pattern, sufficient steam will not likely reach that area. These areas include:

- a. Cobble Zone – the area around CZ20
- b. Upper Water Bearing Zone – the area of UWBZ21, UWBZ 23, UWBZ26, and UWBZ27
- c. Lower Saturated Zone – southern perimeter

I strongly recommend that the use of cyclic steam injection (as described in Section 3.3 of the Final Remedial Design and Remedial Action Work Plan) be considered for these areas in order to treat them with steam while minimizing the risk of spreading LNAPL outside of the treatment area.

Specific Comments

3. The third bullet at the top of page 3-1 (starting on line 168) states that photoionization detector (PID) readings below 45 parts per million volume (ppmv) received a score of 0, readings from 45 to 449 ppmv received a score of 1, and readings above 450 ppmv received a score of 2. What is the basis for choosing the ranges that are given here?

4. The fifth bullet at the top of page 3-1 (starting on line 174) states that TPH results below 25 mg/kg received a score of 0, while results from 25 to 249 mg/kg received a score of 1, and results greater than 250 mg/kg received a score of 2. Both gasoline range organics (TPH GRO) and diesel range organics (TPH DRO) were measured on soil samples obtained for analysis. Which TPH results were used for the scoring? What is the basis for choosing the ranges that are given here?

5. The fifth bullet at the top of page 3-1 (starting on line 174) states that TPH results only from the pre-design investigation (PDI) wells was used in the scoring. Why were the TPH results for soil samples obtained from other LSZ wells not included in the scoring?

6. The Legend for Figures 3-1 to 3-7 show that a red circle around a well indicates "Indication of Potential Residual LNAPL." This is misleading, given that many of the soil sample results clearly have fuel component concentrations that indicate the presence of fuel as an LNAPL when consideration is given to the criteria presented in Feenstra et al. (1991). I recommend that this label be changed to "Indication of LNAPL."

7. On Figures 4-1 to 4-3, please provide larger symbols for the injection and extraction wells (similar to what was used on slides 10 and 15 from the March 25-26, 2014 BCT Meeting). This will make the 'pattern' of the injection and extraction wells in each of the zones easier to see.

If you would like to discuss these comments, I would be happy to do so. I can be reached at (580) 436-8548 or davis.eva@epa.gov.

Reference

Feenstra, S., D. M. MacKay, and J. A. Cherry, A Method for Assessing Residual NAPL Based on Organic Chemical Concentrations in Soil Samples, Ground Water Monitoring and Remediation, 128-136, Spring 1991.

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